CLAIMS

What is claimed is:

1. A method for spectral imaging, the method comprising:

capturing high spectral resolution data of at least a first portion of a first scene using a first plurality of channels;

determining a first set of channels from a second plurality of channels which can reconstruct spectra of the first portion of the first scene to satisfy a first error criterion when compared with the captured high spectral resolution data; and,

capturing pixel data of the at least a second portion of at least the first scene using the first set of channels.

2. The method as set forth in claim 1 wherein the first set of channels from the second plurality of channels comprises a smallest number of the plurality of channels which can be used to reconstruct spectra of the first portion of the first scene to satisfy a first error criterion when compared with the captured high spectral resolution data.

3. The method as set forth in claim 1 wherein the first set of channels from the second plurality of channels comprises a first stored number of the plurality of channels or a subset of the first stored number of the second plurality of channels which can be used to reconstruct spectra of the first portion of the first scene to satisfy a first error criterion when compared with the captured high spectral resolution data.

4. The method as set forth in claim 1 further comprising determining a first transform from the first set of channels which can reconstruct spectra.

5. The method as set forth in claim 4 further comprising reproducing the image spectra using the first transform and the captured pixel data from the at least a second portion of at least the first scene.

6. The method as set forth in claim 4 further comprising storing the first transform.

7. The method as set forth in claim 4 further comprising:

at least once capturing high spectral resolution data of at least a third portion of a second scene; and,

capturing pixel data of the at least a third portion of a second scene using the first set of channels; and,

reconstructing estimated spectra by applying the first transform to the captured pixel data;

comparing the high spectral resolution data with the reconstructed estimated spectra to determine an intermittent error; and

determining a second set of channels from the second plurality of channels which can reconstruct spectra of the third portion of the second scene to satisfy the first error criterion when compared with the captured high spectral resolution data if the intermittent error does not satisfy a second error criterion; and

capturing pixel data of at least a fourth portion of any remaining portion of at least the second scene using the second set of channels.

8. The method as set forth in claim 7 wherein the first and second error criteria are the same.

9. The method as set forth in claim 7 further comprising capturing high spectral resolution data of the third portion of the second scene using the first plurality of channels.

10. The method as set forth in claim 7 wherein the second set of channels from the second plurality of channels comprises a first stored number of the plurality of channels or a subset of the first stored number of the plurality of channels which can be used to reconstruct spectra of the third portion of the

second scene to satisfy a second error criterion when compared with the captured high spectral resolution data.

11. The method as set forth in claim 7 further comprising determining a second transform from the second set of channels which can reconstruct spectra.

12. The method as set forth in claim 11 further comprising reproducing the image spectra using the first and second transforms from the first and second sets of channels and the captured pixel data from the at least a second and fourth portions of at least the first and second scenes.

13. The method as set forth in claim 11 further comprising storing the second transform.

14. The method as set forth in claim 1 further comprising storing the captured pixel data from the first set of channels from the second portion of the first scene.

15. The method as set forth in claim 7 further comprising storing the captured pixel data from the second portion of the first scene such that the captured pixel data from the second portion of the first scene remains associated with the first transform.

16. The method as set forth in claim 7 further comprising storing the captured pixel data from the second set of channels from the at least a fourth portion of at least the second scene.

17. The method as set forth in claim 15 further comprising storing the captured pixel data from the fourth portion of the second scene such that the captured pixel data from the fourth portion remains associated with the second transform.

18. The method as set forth in claim 1 wherein the first error criterion requires that the reconstructed spectra of the first portion of the first scene be within a first error tolerance from the captured high spectral resolution data or that the reconstructed spectra of the first portion of the first scene be associated with a minimum value for a predetermined metric when compared with the captured high spectral resolution data.

19. The method as set forth in claim 8 wherein the second error criterion requires that the reconstructed spectra of the third portion of the second scene be within a second error tolerance from the captured high spectral resolution data or that the reconstructed spectra of the third portion of the second scene be associated with a minimum value for a predetermined metric when compared with the captured high spectral resolution data.

20. The method as set forth in claim 1 further comprising:

determining which aspects of the captured estimated spectral resolution data are signatures of original color levels and which aspects of the captured estimated spectral resolution data are signatures of deterioration artifacts based on stored image information; and

correcting the aspects of the captured estimated spectral resolution data which are signatures of deterioration artifacts.

21. The method as set forth in claim 1 wherein the first plurality of channels and the second plurality of channels are identical.

22. A system for spectral imaging, the system comprising:

a first imaging sub-system that captures high spectral resolution data of at least a portion of a first scene using a plurality of channels; and

a spectral processing system that determines a first set of channels from the second plurality of channels which can reconstruct spectra of the portion of the image to satisfy a first error criterion when compared to the

captured high spectral resolution data, wherein a second imaging sub-system captures pixel data of the scene using the first set of channels.

23. The system as set forth in claim 22 wherein the first set of channels from the plurality of channels comprises a smallest number of channels which can be used to reconstruct spectra of the first portion of the scene to satisfy a first error criterion when compared with the captured high spectral resolution data.

24. The system as set forth in claim 22 wherein the first set of channels from the first plurality of channels comprises a first stored number of the plurality of channels or a subset of the first stored number of the plurality of channels which can be used to reconstruct spectra of the first portion of the first scene to satisfy a first error criterion when compared with the captured high spectral resolution data.

25. The system as set forth in claim 22 wherein the spectral processing system determines a transform from the first set of channels and the imaging system reproduces the image using the transform and the captured pixel data.

26. The system as set forth in claim 22 wherein the spectral processing system stores the transform from the first set of channels.

27. The system as set forth in claim 22 wherein the spectral processing system compares at least once the high spectral resolution data for a second portion of a second scene against the estimated spectral resolution data captured using the first set of channels for the second portion of the second scene to determine an intermittent error, the spectral processing system determines a second set of channels from the second plurality of channels which can reconstruct spectra of the second portion of the second scene to satisfy the first error criterion when compared to the captured high spectral resolution data if the intermittent error is greater then a second error tolerance, and the second imaging

sub-system captures pixel data of at least a portion of any remaining portion of at least the second scene using the second set of channels.

28. The system as set forth in claim 27 wherein the imaging system captures high spectral resolution data of the second portion of the image using the first plurality of channels.

29. The system as set forth in claim 27 wherein the spectral processing system determines a second transform from the second set of channels and the imaging system reproduces the image using the first and second transforms and the pixel data captured using the first and second sets of channels.

30. The system as set forth in claim 27 wherein the spectral processing system determines a transform from the first set of channels and stores the transform and the pixel data captured using the first and second sets of channels.

31. The system as set forth in claim 27 wherein the spectral processing system determines which aspects of the captured estimated spectral resolution data are signatures of original color levels and which aspects of the captured estimated spectral resolution data are signatures of deterioration artifacts based on stored image information and wherein the spectral processing system corrects the aspects of the captured estimated spectral resolution data which are signatures of deterioration artifacts.

32. The system as set forth in claim 22 wherein the first plurality of channels and the second plurality of channels are identical.

33. A method for spectral imaging, the method comprising:

capturing a first high spectral resolution data of at least a first portion of a first scene using a plurality of channels;

capturing pixel data of at least a second portion of a first scene using a first set of channels from the first plurality of channels;

determining a first transform based on the first set of channels and the first high spectral resolution data; and

generating an image of the first scene using the transform and the captured pixel data.

34. The method as set forth in claim 33 further comprising recording the generated image on a media.

35. The method as set forth in claim 33 further comprising storing the generated image.

36. The method as set forth in claim 33 further comprising:

capturing high spectral resolution data of at least a second portion of a second scene using a plurality of channels;

applying the first transform to the pixel data from the first set of channels to the second portion of the second scene to produce spectral estimates;

compare the spectral estimates to the high spectral resolution data to determine an intermittent error; and

determining a second transform based on the first set of channels and the second high spectral resolution data if the intermittent error is greater than a first error tolerance.

37. A system for spectral imaging, the system comprising:

a first imaging sub-system that captures a first high spectral resolution data of at least a first portion of a first scene using a plurality of channels;

a second imaging sub-system that captures pixel data of at least a second portion of a first scene using a first set of channels from a plurality of channels; and

a spectral processing system that determines a first transform based on the first set of channels and the first high spectral resolution

data generates the image of the first scene using the transform and the captured pixel data.

38. The system as set forth in claim 37 wherein a recording system records the generated image on a media.

39. The system as set forth in claim 37 wherein the spectral processing system stores the generated image.

40. The system as set forth in claim 37 wherein the first imaging sub-system captures high spectral resolution data of at least a portion of a second scene using a plurality of channels and wherein the spectral imaging system applies the first transform to the pixel data from the first set of channels of the at least a portion of the second scene producing spectral estimates, compares the spectral estimates to the high spectral resolution data to determine an intermittent error and determines a second transform based on the first set of channels and the second high spectral resolution data if the intermittent error is greater than a first error tolerance.

41. The system as set forth in claim 37 wherein the first and second imaging sub-system are the same.